

STRATEGY FOR RECOVERY

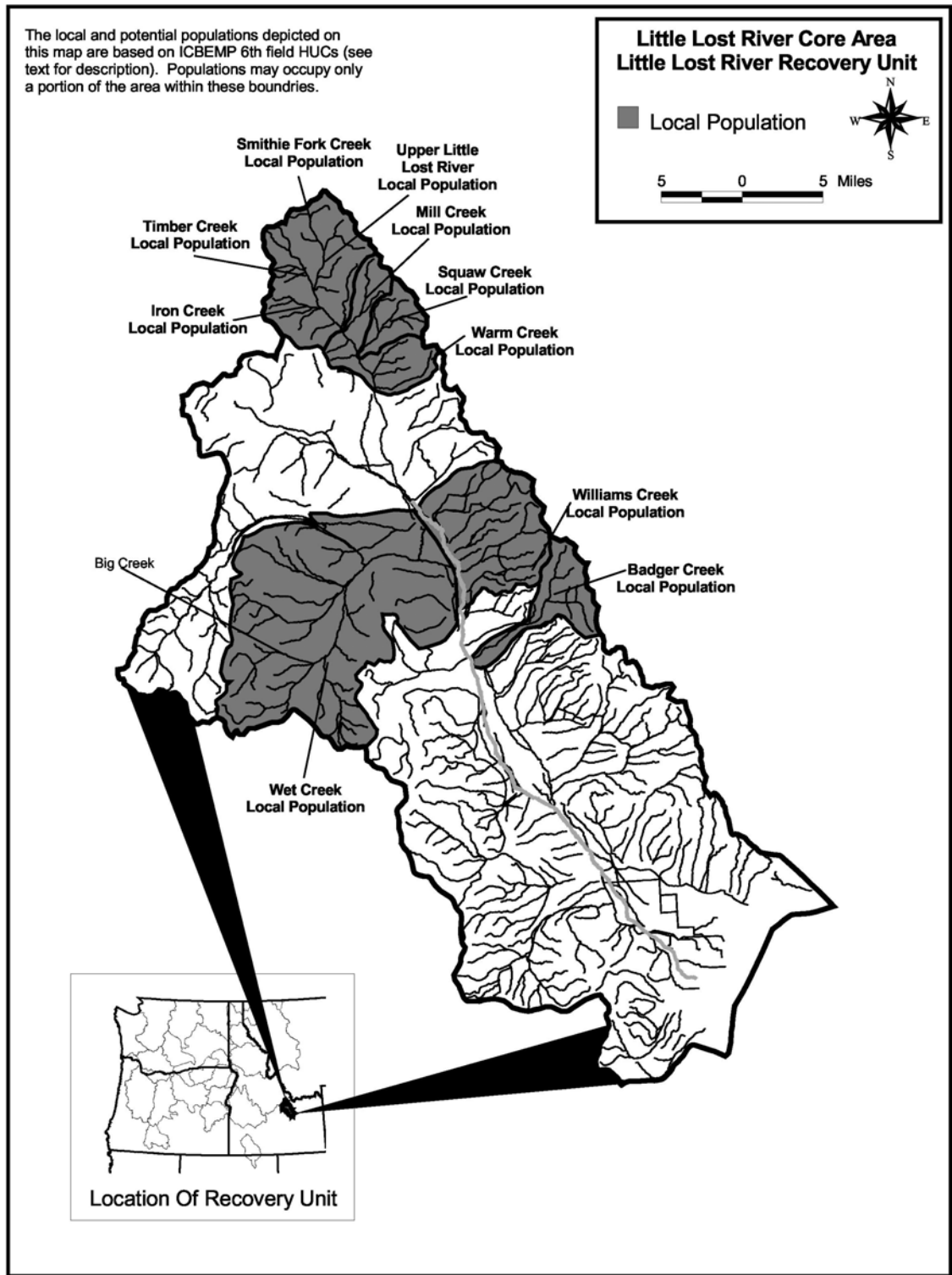
A core area represents the closest approximation of a biologically functioning unit for bull trout. The combination of core habitat (*i.e.*, habitat that could supply all the necessary elements for the long-term security of bull trout, including for both spawning and rearing, as well as for foraging, migrating, and overwintering) and a core population (*i.e.*, bull trout inhabiting a core habitat) constitutes the basic core area upon which to gauge recovery within a recovery unit. Within a core area, many local populations may exist.

Bull trout are distributed widely in the Little Lost River Recovery Unit, with individuals occurring from the headwaters in the upper Little Lost River to below the flood-control structure near Howe. Bull trout have been observed in about 20 streams since the 1980's (Appendix A). Both resident and migratory (fluvial) bull trout occur in the recovery unit, and migratory individuals probably use spawning and rearing habitat in streams in the upper portion of the Little Lost River (*e.g.*, Firebox Creek, Smithie Fork Creek, and Iron Creek watersheds) and perhaps the Wet Creek drainage. The Little Lost River Recovery Unit consists of a single core area, which includes the mainstem river and tributaries in which bull trout have been observed (Figure 3). The core area includes 10 local populations (Table 3).

Table 3. Core area and local populations in the Little Lost River Recovery Unit, Idaho.

Recovery unit	Core area	Local populations
Little Lost River	Little Lost River	<ol style="list-style-type: none"> 1. Badger Creek (including Bunting Canyon Creek) 2. Williams Creek 3. Wet Creek (including Big Creek) 4. Warm Creek 5. Squaw Creek (tributary to Sawmill Creek) 6. Mill Creek 7. Iron Creek (including Hawley and Jackson creeks) 8. Timber Creek (including Camp, Redrock, and Slide creeks) 9. Smithie Fork Creek 10. Upper Little Lost River (Iron Creek confluence to headwaters, excluding the Timber Creek and Smithie Fork Creek watersheds)

Figure 3. Location of bull trout local populations within the Little Lost River Recovery Unit.



Recovery Goals and Objectives

The goal of the bull trout recovery plan is to **ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed throughout the species' native range so that the species can be delisted.** To achieve this goal, the following objectives have been identified for bull trout in the Little Lost River Recovery Unit:

- ▶ Maintain current distribution of bull trout and restore distribution in previously occupied areas within the Little Lost River Recovery Unit.
- ▶ Maintain stable or increasing trends in abundance of bull trout in the Little Lost River Recovery Unit.
- ▶ Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.
- ▶ Conserve genetic diversity and provide opportunity for genetic exchange.

Rieman and McIntyre (1993) and Rieman and Allendorf (2001) evaluated the bull trout population numbers and habitat thresholds necessary for long-term viability of the species. They identified four elements, and the characteristics of those elements, to consider when evaluating the viability of bull trout populations. These four elements are 1) number of local populations; 2) adult abundance (defined as the number of spawning fish present in a core area in a given year); 3) productivity, or the reproductive rate of the population (as measured by population trend and variability); and 4) connectivity (as represented by the migratory life history form and functional habitat). For each element, the Little Lost River Recovery Unit Team classified bull trout into relative risk categories based on the best available data and the professional judgment of the team.

The Little Lost River Recovery Unit Team also evaluated each element under a potential recovered condition to produce recovery criteria. Evaluation of these elements under a recovered condition assumed that actions identified within this chapter had been implemented. Recovery criteria for the Little Lost River Recovery Unit reflect 1) the

stated objectives for the recovery unit, 2) evaluation of each population element in both current and recovered conditions, and 3) consideration of current and recovered habitat characteristics within the recovery unit. Recovery criteria will probably be revised in the future as more detailed information on bull trout population dynamics becomes available. Given the limited information on bull trout, both the level of adult abundance and the number of local populations needed to lessen the risk of extinction should be viewed as a best estimate.

This approach to developing recovery criteria acknowledges that the status of populations in some core areas may remain short of ideals described by conservation biology theory. Some core areas may be limited by natural attributes or by patch size and may always remain at a relatively high risk of extinction. Because of limited data within the Little Lost River Recovery Unit, the recovery unit team relied heavily on the professional judgment of its members.

Local Populations. Metapopulation theory is important to consider in bull trout recovery. A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994) (see Chapter 1). Multiple local populations distributed and interconnected throughout a watershed provide a mechanism for spreading risk from stochastic events. In part, distribution of local populations in such a manner is an indicator of a functioning core area. Based in part on guidance from Rieman and McIntyre (1993), bull trout core areas with fewer than 5 local populations are at increased risk, core areas with between 5 and 10 local populations are at intermediate risk, and core areas with more than 10 interconnected local populations are at diminished risk. The Little Lost River Recovery Unit contains one core area, the Little Lost River core area. For the Little Lost River Core Area, there are currently 10 known local population. According to the above guidance, bull trout in the Little Lost River Core Area is at intermediate risk.

Adult Abundance. The recovered abundance levels in the Little Lost River Recovery Unit were determined by considering theoretical estimates of effective population size, historical census information, and the professional judgment of recovery team members. In general, effective population size is a theoretical concept that allows us to predict potential future losses of genetic variation within a population due to small

population sizes and genetic drift (see Chapter 1). For the purpose of recovery planning, effective population size is the number of adult bull trout that successfully spawn annually. Based on standardized theoretical equations (Crow and Kimura 1970), guidelines have been established for maintaining minimum effective population sizes for conservation purposes. Effective population sizes of greater than 50 adults are necessary to prevent inbreeding depression and a potential decrease in viability or reproductive fitness of a population (Franklin 1980). To minimize the loss of genetic variation due to genetic drift and to maintain constant genetic variance within a population, an effective population size of at least 500 is recommended (Franklin 1980; Soule 1980; Lande 1988). Effective population sizes required to maintain long-term genetic variation that can serve as a reservoir for future adaptations in response to natural selection and changing environmental conditions are discussed in Chapter 1 of the recovery plan.

For bull trout, Rieman and Allendorf (2001) estimated that a minimum number of 50 to 100 spawners per year is needed to minimize potential inbreeding effects within local populations. In addition, a population size of between 500 and 1,000 adults in a core area is needed to minimize the deleterious effects of genetic variation from drift.

For the purposes of bull trout recovery planning, abundance levels were conservatively evaluated at the local population and core area levels. Local populations containing fewer than 100 spawning adults per year were classified as at risk from inbreeding depression. Bull trout core areas containing fewer than 1,000 spawning adults per year were classified as at risk from genetic drift.

Adult abundance in the Little Lost River Core Area was estimated at 6,250 adults in the 10 known local populations. According to the guidance on abundance above, bull trout in the Little Lost River Core Area are not considered at risk of genetic drift.

Productivity. A stable or increasing population is a key criterion for recovery under the requirements of the Endangered Species Act. Measures of the trend of a population (the tendency to increase, decrease, or remain stable) include population growth rate or productivity. Estimates of population growth rate (*i.e.*, productivity over the entire life cycle) that indicate a population is consistently failing to replace itself also indicate an

increased risk of extinction. Therefore, the reproductive rate should indicate that the population is replacing itself, or growing.

Since estimates of the total population size are rarely available, the productivity or population growth rate is usually estimated from temporal trends in indices of abundance at a particular life stage. For example, redd counts are often used as an index of a spawning adult population. The direction and magnitude of a trend in the index can be used as a surrogate for the growth rate of the entire population. For instance, a downward trend in an abundance indicator may signal the need for increased protection, regardless of the actual size of the population. A population that is below recovered abundance levels, but that is moving toward recovery, would be expected to exhibit an increasing trend in the indicator.

The population growth rate is an indicator of probability of extinction. This probability cannot be measured directly, but it can be estimated as the consequence of the population growth rate and the variability in that rate. For a population to be considered viable, its natural productivity should be sufficient for the population to replace itself from generation to generation. Evaluations of population status will also have to take into account uncertainty in estimates of population growth rate or productivity. For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time.

Based on the stable population trend and the number of adult bull trout and local populations in the Little Lost River Core Area, bull trout are considered to be at a diminishing risk.

Connectivity. The presence of the migratory life history form within the Little Lost River Recovery Unit was used as an indicator of the functional connectivity of the recovery unit. If the migratory life form was absent, or if the migratory form was present but local populations lacked connectivity, the core area was considered to be at increased risk. If the migratory life form persisted in at least some local populations, with partial ability to connect with other local populations, the core area was judged to be at intermediate risk. Or if the migratory life form was present in all or nearly all local populations and if that form had the ability to connect with other local populations, the core area was considered to be at diminished risk. Migratory bull trout may persist in some local

populations in the Little Lost River Core Area and, therefore, are considered to be at an intermediate risk.

Recovery Criteria

Recovery criteria (summarized in Table 4) for bull trout in the Little Lost River Recovery Unit are the following:

1. **Distribution criteria will be met when the current distribution of bull trout in the 10 local populations that have been identified is maintained.** Existing local populations include Badger Creek, Williams Creek, Wet Creek (including Big Creek), Warm Creek, Squaw Creek, Mill Creek, Iron Creek (including Hawley and Jackson Creeks), Timber Creek (including Camp, Redrock, and Slide Creeks), Smithie Fork Creek, and the upper Little Lost River (Iron Creek confluence to headwaters, excluding the Timber Creek and Smithie Fork Creek watersheds). The recovered distribution of bull trout in the Wet Creek local population requires fish in Big Creek, a tributary to Wet Creek.

Table 4. Summary of values for recovery criteria in the Little Lost River Recovery Unit.

Recovery unit	Number of core areas	Number of local populations	Adult abundance	Trend in abundance	Number of barriers addressed
Little Lost River	1	10	6,750	stable-increasing	4

2. **Abundance criteria will be met when the estimated abundance of adult bull trout is at least 6,750 individuals in the Little Lost River Recovery Unit.** Using professional judgment, the Little Lost River Recovery Unit Team estimated abundance of adult bull trout for the recovery unit by using surveys of fish densities and considering current habitat conditions and potential conditions after threats have been addressed. Because most bull trout in the recovery unit are resident fish, fish that are 180 millimeters (7.1 inches) or longer were considered adults.

Minimum abundance of adult bull trout per local population to meet the criterion are presented in Appendix C.

3. **Trend criteria will be met when adult bull trout exhibit stable or increasing trends in abundance, over at least two generations, in the Little Lost River Recovery Unit.**
4. **Connectivity criteria will be met when specific barriers to bull trout migration in the Little Lost River Recovery Unit have been addressed.** Tasks to identify and assess barriers to bull trout passage are recommended in this recovery plan. Sites and activities necessary to fulfill connectivity criteria include the following: evaluating passage options at the diversion structures in the lower reaches of Badger and Williams Creeks (tasks 1.2.1, 1.2.2, and 1.2.3), at the falls created by debris and perhaps a head-cut in Bunting Creek (task 1.2.13), and at the flood-control structure near Howe (task 1.2.11); implementing appropriate actions based on the results of the options evaluated in the tasks (tasks appear in the Recovery Measures Narrative and the Implementation Schedule); and conducting coordinated review with the U.S. Fish and Wildlife Service during implementation of the tasks.

Recovery criteria for the Little Lost River Recovery Unit were established to assess whether recovery actions are resulting in the recovery of bull trout. The Little Lost River Recovery Unit Team expects that the recovery process will be dynamic and will be refined as more information becomes available. While removal of bull trout as a listed species under the Endangered Species Act (*i.e.*, delisting) can only occur for the entity that was listed (Columbia River distinct population segment), the criteria listed above will be used to determine when the Little Lost River Recovery Unit Recovery Unit is fully contributing to recovery of the population segment.

ACTIONS NEEDED

Recovery Measures Narrative

In this chapter and all other chapters of the bull trout recovery plan, the recovery measures narrative consists of a hierarchical listing of actions that follows a standard template. The first-tier entries are identical in all chapters and represent general recovery tasks under which specific (*e.g.*, third-tier) tasks appear when appropriate. Second-tier entries also represent general recovery tasks under which specific tasks appear. Second-tier tasks that do not include specific third-tier actions are usually programmatic activities that are applicable across the species' range; they appear in *italic type*. These tasks may or may not have third-tier tasks associated with them; see Chapter 1 for more explanation. Some second-tier tasks may not be sufficiently developed to apply to the recovery unit at this time; they appear in *a shaded italic type (as seen here)*. These tasks are included to preserve consistency in numbering tasks among recovery unit chapters and intended to assist in generating information during the comment period for the draft recovery plan, a period when additional tasks may be developed. Third-tier entries are tasks specific to the Little Lost River Recovery Unit. They appear in the Implementation Schedule that follows this section and are identified by three numerals separated by periods.

The Little Lost River Recovery Unit chapter should be updated or revised as recovery tasks are accomplished, environmental conditions change, or monitoring results or other new information becomes available. Revisions to the Little Lost River Recovery Unit chapter will probably focus on priority streams or stream segments within core areas where restoration activities occurred and where habitat or bull trout populations have shown a positive response. The Little Lost River Recovery Unit Team should meet annually to review annual monitoring reports and summaries and to make recommendations to the U.S. Fish and Wildlife Service.

- 1 Protect, restore, and maintain suitable habitat conditions for bull trout.

- 1.1 Maintain or improve water quality in bull trout core areas or potential core habitat.
 - 1.1.1 Develop and implement a management strategy to reduce sediment levels on National Forest and private lands in the Badger Creek watershed. Habitat alterations from roads and grazing in the upper portions of the watershed have contributed to high levels of sediment. Natural resource agencies (*e.g.*, the U.S. Forest Service, Natural Resources Conservation Service) and private landowners should develop and implement a strategy to reduce sediment levels on both public and private lands in the Badger Creek watershed.
 - 1.1.2 Reduce sediment from roads and trails in the Iron Creek and Timber Creek watersheds. Mass wasting, erosion, and unstable streambanks associated primarily with roads and trails are contributing high levels of sediment to the two watersheds. Actions (*e.g.*, relocation, closure, obliteration, or other modifications of roads and trails) need to be implemented to reduce sediment levels.
 - 1.1.3 Develop and implement a management strategy to reduce sediment levels in bull trout spawning and rearing habitat in the Wet Creek watershed. Habitat alterations from roads, grazing, and trails in the upper portion of the watershed have contributed to high levels of sediment. Natural resource agencies (*e.g.*, the U.S. Forest Service, Natural Resources Conservation Service) and private landowners should develop and implement a strategy to reduce sediment levels on both public and private lands in the Wet Creek watershed.
- 1.2 Identify barriers or sites of entrainment for bull trout and implement tasks to provide passage and eliminate entrainment.

- 1.2.1 Provide upstream fish passage at the Badger Creek water diversion. A water diversion on Badger Creek blocks upstream fish passage and periodically dewateres the lower 0.5 kilometer (0.3 mile) of the stream during summer months. Upstream fish passage should be provided at the diversion structure.
- 1.2.2 Assess feasibility of providing minimum stream flows between the Badger Creek diversion and the Little Lost River. Badger Creek is periodically isolated from the Little Lost River because all water is diverted from the lower 0.5 kilometer (0.3 mile) of the stream during summer months. If providing minimum stream flows is found to be feasible, providing adequate flows would reconnect the stream with the river.
- 1.2.3 Evaluate feasibility of reconnecting Williams Creek to the Little Lost River by providing adequate stream flows. Two diversions, one operated during spring through fall and the other operated during the winter, have completely dewatered the lower 2 to 3 kilometers (1.2 to 1.9 miles) of Williams Creek. The diversions have reduced habitat available to bull trout and prevented fish movement between Williams Creek and the Little Lost River. If providing minimum stream flows is found to be feasible, providing adequate flows would reconnect the Williams Creek with the Little Lost River and expand habitat available to bull trout.
- 1.2.4 Analyze culvert survey data collected by the Forest Service and develop a plan to address the culverts found to inhibit fish passage. The U.S. Forest Service has conducted a survey of culverts on National Forest lands in the Little Lost River basin. The data have not been analyzed to identify

culverts inhibiting fish passage. Specific culverts likely to be affecting bull trout are noted in additional recovery tasks.

- 1.2.5 Conduct survey of culverts on Bureau of Land Management and private lands and develop a plan to address culverts found to inhibit fish passage. A comprehensive survey to identify culverts that prevent or inhibit fish passage has not been conducted on Bureau of Land Management and private lands. Information generated from the survey should be used to develop a plan to address culverts that inhibit fish passage.
- 1.2.6 Evaluate fish passage at specific culverts on Timber Creek (U.S. Forest Service Road #105) and Redrock Creek (Forest Service Road #460) and modify or replace culverts, as necessary, to provide or improve fish passage. The two culverts may interfere with upstream movement of small fish. Necessary modifications should be made so that the culverts do not inhibit fish passage.
- 1.2.7 Evaluate fish passage at specific culverts on Jackson Creek and Hawley Creek (U.S. Forest Service Road #104 on both streams) and modify or replace culverts, as necessary, to provide or improve fish passage. The two culverts may interfere with upstream movement of fish. Necessary modifications should be made so that the culverts do not inhibit fish passage.
- 1.2.8 Evaluate fish passage at two culverts on the upper Little Lost River (U.S. Forest Service Road #101) and modify or replace the culverts, as necessary, to provide or improve fish passage. The two culverts may interfere with upstream movement of small fish. Necessary modifications should be made so that the culverts do not inhibit fish passage.

- 1.2.9 Remove artificial barrier on lower Camp Creek. A head-cut associated with a road crossing on Camp Creek appears to be a barrier to upstream fish movement. A restoration approach that is compatible with the surrounding stream channel should be developed and actions should be implemented to provide or improve fish passage.
- 1.2.10 Inventory diversions in the lower Little Lost River, evaluate entrainment and feasibility of eliminating or reducing entrainment, and implement appropriate actions. Numerous diversions occur on the lower Little Lost River (from the Summit Creek confluence downstream to the Little Lost River Sinks). The influence of the diversions on fish entrainment, movement, and habitat conditions is not known.
- 1.2.11 Evaluate bull trout loss at the flood-control structure near Howe and implement tasks to reduce negative effects. Bull trout may be lost in the diversion canals or trapped below the flood-control structure near Howe when in operation. Fish loss should be quantified and structural or operational approaches to prevent or reduce loss should be developed and implemented, consistent with terms and conditions in a recent biological opinion (USFWS 2002).
- 1.2.12 Evaluate potential of Moonshine Creek to support bull trout and provide passage if habitat is suitable for bull trout. Bull trout do not currently occur in Moonshine Creek, a tributary to the upper Little Lost River. Habitat may be suitable, but a culvert prevents fish access from the Little Lost River. If habitat is suitable, replace the culvert to allow bull trout access to Moonshine Creek. Expanding the habitat available to bull trout improves the likelihood of achieving recovery.

1.2.13 Evaluate barrier formed by debris, and perhaps a head-cut, on Bunting Canyon Creek and implement tasks to expand bull trout distribution upstream of the barrier. In Badger Creek, bull trout are restricted to a relatively short reach of the stream and to the lower 300 meters (984 feet) of Bunting Canyon Creek, to where debris and possibly a head-cut have created a 1-meter (3.3-feet) waterfall in the tributary. The waterfall prevents bull trout access to about 3 kilometers (1.9 miles) of apparently suitable habitat. A restoration approach that is compatible with the surrounding stream channel should be developed and implemented to provide fish passage and should include the introduction of bull trout upstream of the barrier. The intent of introductions is to expand bull trout distribution in this relatively small, currently isolated local population.

1.3 Identify impaired stream channel and riparian areas and implement tasks to restore their functions.

1.3.1 Evaluate effects of livestock grazing on bull trout egg incubation and on spawning and rearing habitat and adjust grazing strategy as appropriate. If grazing is found to be negatively affecting bull trout eggs and habitat (*e.g.*, through sediment production, streambank and channel instability), adjustments to grazing strategies (*e.g.*, improvements to cattle dispersal, timing of use, and herding) should be made to improve integrity of riparian vegetation. Areas on which to focus include Badger, Worm, Squaw, Mill, Iron, Timber, and Smithie Fork Creeks and the upper Little Lost River.

1.3.2 Relocate Mill Creek trailhead away from Mill Creek and rehabilitate the existing trailhead site. Disbursed recreation is probably affecting streambanks and riparian vegetation at the trailhead. Relocating the trailhead away from the stream

and rehabilitating the site will improve aquatic and riparian conditions.

- 1.3.3 Evaluate the effects of channelization on the middle portion of the Little Lost River (*i.e.*, the reach between the confluences of Iron and Summit Creeks) and develop and implement a strategy to restore a natural stream channel.

Much of the Little Lost River between the National Forest boundary and Summit Creek has been channelized, which simplifies aquatic habitat and may increase water temperatures. Although channelized reaches are no longer maintained and are gradually returning to more natural conditions, the effects should be assessed so that activities can be developed and implemented to restore more natural conditions to the channelized reaches.

- 1.3.4 Evaluate habitat conditions in the lower portion of the Little Lost River (*i.e.*, the reach from the confluence of Summit Creek to the Little Lost River Sinks) and develop and implement a strategy to restore habitat conditions.

Habitat in the lower portion of the Little Lost River has been altered by grazing, channelization, and dewatering, processes that have increased water temperatures and reduced the quality and amount of migratory, foraging, and overwintering habitat for bull trout. Operation of the flood-control structure near Howe seasonally dewateres the lowest 16.9 kilometers (10.5 miles) of the river. Habitat conditions in the reach should be assessed so that activities can be developed and implemented to restore more natural conditions to the lower river.

- 1.4 *Operate dams to minimize negative effects on bull trout in reservoirs and downstream.*

- 1.5 *Identify upland conditions that negatively affect bull trout habitats and implement tasks to restore appropriate functions.*
- 2 Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.
 - 2.1 *Develop, implement, and enforce public and private fish stocking policies to reduce stocking of nonnative fishes that affect bull trout.*
 - 2.2 Evaluate enforcement policies for preventing illegal transport and introduction of nonnative fishes.
 - 2.2.1 Investigate the existence of brown trout in ponds on private lands and work with landowners to prevent introductions in streams. Brown trout have not been documented in the Little Lost River basin, but they have reportedly been caught in private ponds in the lower portion of the basin. If brown trout are found, work with landowners to prevent the species from becoming established and possibly negatively interacting bull trout.
 - 2.3 *Provide information to the public about ecosystem concerns of illegal introductions of nonnative fishes.*
 - 2.4 Evaluate biological, economic, and social effects of controlling nonnative fishes.
 - 2.4.1 Evaluate feasibility of reducing or eliminating brook trout in Big Creek and implement appropriate actions. Brook trout provide a popular fishery but are thought to be responsible for the decline and possible extirpation of bull trout in Big Creek, a tributary of Wet Creek. Big Creek is an important area for bull trout in the Little Lost River Recovery Unit. A feasibility study and plan evaluating appropriate methods to

remove brook trout and to establish an alternative fishery (e.g., sterile rainbow trout) should be conducted and implemented.

2.5 Implement control of nonnative fishes where found to be feasible and appropriate.

2.5.1 Assess feasibility of eradicating brook trout from the Wet Creek, Squaw Creek, and Mill Creek drainages. Interactions (e.g., competition, predation, and hybridization) with brook trout are factors that negatively affect bull trout in the three drainages. The feasibility of removing brook trout needs to be evaluated and an appropriate program to eradicate brook trout implemented.

2.6 Develop tasks to reduce negative effects of nonnative taxa on bull trout.

2.6.1 Assess feasibility of temporally installing fish barriers above the upper limit of brook trout distribution in Wet, Squaw, and Mill Creeks. Brook trout appear to be expanding their distribution into areas occupied by bull trout in the three drainages. The use of fish barriers to inhibit brook trout movement should be evaluated as an interim protection measure for bull trout, while work is conducted on methods to eradicate brook trout. Actions developed from this evaluation should be designed to minimally inhibit movement of bull trout.

2.6.2 Monitor the lower portions of Badger and Williams Creeks for brook trout if barriers to fish passage with the Little Lost River are corrected. Brook trout may invade the two streams if passage is reestablished with the Little Lost River. Actions

to prevent brook trout invasion should be implemented if monitoring detects brook trout.

- 2.6.3 Monitor the lower portions of Warm, Iron, Timber, and Smithie Fork Creeks and the upper Little Lost River for brook trout. Brook trout do not currently occur in the streams, but no known physical barriers prevent their invasion. Actions to prevent brook trout invasion should be implemented if monitoring detects brook trout.

- 3 Establish fisheries management goals and objectives compatible with bull trout recovery and implement practices to achieve goals.

3.1 *Develop and implement State and Tribal native fish management plans integrating adaptive research.*

- 3.2 Evaluate and prevent overharvest and incidental angling mortality of bull trout.

- 3.2.1 Evaluate effects of fishing (e.g., illegal harvest, hooking mortality) on bull trout and implement appropriate actions (e.g., providing information to anglers, enforcing regulations, revising regulations) to reduce any negative effects. Fishing may be negatively affecting bull trout through such factors as anglers misidentifying fish, mishandling fish, and not complying with regulations. Factors associated with fishing should be evaluated, and actions to reduce any negative effects, such as increasing enforcement, initiating angler education programs, and revised regulations, should be implemented. Areas for focusing efforts include the entire Little Lost River (upper, middle, and lower portions), Wet Creek, Timber Creek, and Smithie Fork Creek.

- 3.3 *Evaluate potential effects of introduced fishes and associated sport fisheries on bull trout recovery and implement tasks to minimize negative effects on bull trout.*
- 3.4 *Evaluate effects of existing and proposed sport fishing regulations on bull trout.*
- 4 Characterize, conserve, and monitor genetic diversity and gene flow among local populations of bull trout.
 - 4.1 Incorporate conservation of genetic and phenotypic attributes of bull trout into recovery and management plans.
 - 4.1.1 Collect samples for genetic analysis to contribute to establishing a program to understand the genetic baseline and monitor genetic changes throughout the range of bull trout.
(See Chapter 1 narrative.)
 - 4.1.2 Describe and monitor genetic and phenotypic characteristics of bull trout and incorporate information into management strategies. The interaction of the genetic composition of bull trout with particular environments results in phenotypic diversity and perhaps local adaption. Such information for particular groups of bull trout and their habitats should be generated and incorporated into management strategies to improve their effectiveness.
 - 4.2 Maintain existing opportunities for gene flow among bull trout populations.
 - 4.2.1 Prevent the establishment of barriers that may inhibit the movement of bull trout within the Little Lost River Recovery Unit (e.g., structural barriers or unsuitable habitat conditions) and investigate additional opportunities to improve passage.

Some construction and land management activities may create barriers that inhibit bull trout movement. Activities that may potentially create barriers should be altered so that bull trout movement is not impeded. The possibility of using barriers to restrict brook trout movement (task 2.6.1) is the subject of an evaluation and using such barriers is intended to be temporary while a study is conducted.

- 4.3 *Develop genetic management plans and guidelines for appropriate use of transplantation and artificial propagation.*
- 5 Conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks.
 - 5.1 *Design and implement a standardized monitoring program to assess the effectiveness of recovery efforts affecting bull trout and their habitats.*
 - 5.2 *Conduct research evaluating relationships among bull trout distribution and abundance, bull trout habitat, and recovery tasks.*
 - 5.3 *Conduct evaluations of the adequacy and effectiveness of current and past best management practices in maintaining or achieving habitat conditions that are conducive to bull trout recovery.*
 - 5.4 *Evaluate effects of diseases and parasites on bull trout and develop and implement strategies to minimize negative effects.*
 - 5.5 Develop and conduct research and monitoring studies to improve information concerning the distribution and status of bull trout.
 - 5.5.1 Collect and analyze information on size, age, and maturation of bull trout to evaluate estimates of adult-size fish. For

purposes of abundance estimates, bull trout of 180 millimeters (7 inches) total length are considered to be adults. This value is based on scale analyses (*i.e.*, length–age data) from about 85 bull trout collected in the Little Lost River and tributaries during 1985. Additional information is needed to evaluate the estimates and to revise the estimates, if necessary.

- 5.5.2 Investigate habitat conditions in Wet Creek during winter. Recent declines in bull trout abundance in Wet Creek are thought to be related to severe winter conditions exacerbated by drought and degraded habitat (*e.g.*, reduced riparian vegetation). A study investigating habitat and the role of winter conditions on bull trout abundance should be conducted to improve understanding of bull trout declines and to initiate actions to reduce potential negative effects.

- 5.6 *Identify evaluations needed to improve understanding of relationships among genetic characteristics, phenotypic traits, and local populations of bull trout.*

- 6 Use all available conservation programs and regulations to protect and conserve bull trout and bull trout habitats.
 - 6.1 Use partnerships and collaborative processes to protect, maintain, and restore functioning core areas for bull trout.
 - 6.1.1 As appropriate, protect and restore private lands to benefit bull trout by using cooperative processes such as easements, land exchanges, Conservation Reserve Programs, and cost sharing. Some habitats important for bull trout recovery, especially migratory, foraging, and overwintering habitat, occur on private lands. Some may need protection to maintain conditions conducive to bull trout recovery,

whereas others may require restoration to reestablish adequate conditions. A variety of cooperative arrangements should be made with landowners to protect and restore habitats on private lands. Areas of focus should include Badger Creek, Wet Creek, and the middle and lower reaches of the Little Lost River.

- 6.2 *Use existing Federal authorities to conserve and restore bull trout.*
- 6.3 *Enforce existing Federal, State, and Tribal habitat protection standards and regulations and evaluate their effectiveness for bull trout conservation.*
- 7 Assess the implementation of bull trout recovery by recovery units and revise recovery unit plans based on evaluations.
 - 7.1 *Convene annual meetings of each recovery unit team to review progress on recovery plan implementation.*
 - 7.2 *Assess effectiveness of recovery efforts.*
 - 7.3 *Revise scope of recovery as suggested by new information.*